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AUTHOR Conway, Terry L.; Cronan, Terry A.
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ABSTRACT

This study examined the relationships among physical fitness, exercise activity, and both cigarette smoking and smokeless tobacco use among 2,800 United States Navy men. Subgrouping individuals according to their self-reported use of tobacco resulted in maximum sample sizes of 1,406 nonusers, 161 smokeless tobacco users, and 1,233 cigarette smokers, although these numbers were reduced to 975 smokers, 115 smokeless tobacco users, and 825 cigarette smokers in some analyses due to random missing data in the physical fitness measures. Smoking was negatively related to exercise activity. After controlling for exercise effects, smoking still was associated with lower physical endurance, both cardiorespiratory (1.5-mile run) and muscular (sit-ups and push-ups). Smoking was not associated with overall body strength or percent body fat after controlling for exercise activity. In striking contrast, smokeless tobacco use was not significantly correlated with exercise levels or with any of the physical fitness measures after controlling for exercise activity. The lack of significant findings with smokeless tobacco use has important implications for educating young men who may falsely believe that they can use smokeless tobacco without ill consequences to their overall health. (Author/NB)

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Terry L. Conway[1]

Terry A. Cronan[2]

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[1] Naval Health Research Center, P.O. Box 85122, San Diego, CA 92186-5122. Phone: (619) 553-8465. E-mail: conway@vax309.nhrc.navy.mil

[2] Department of Psychology, San Diego State University.

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Terry L. Conway[1]

Terry A. Cronan[2]

Abstract

This study examined the relationships among physical fitness, exercise activity, and both cigarette smoking and smokeless tobacco use in 2,500 U.S. Navy men. Smoking was negatively related to exercise activity. After controlling for exercise effects, smoking still was associated with lower physical endurance, both cardiorespiratory (1.5-mile run) and muscular (sit-ups and push-ups). In striking contrast, smokeless tobacco use was not significantly correlated with exercise or physical fitness. The lack of significant findings with smokeless tobacco use has important implications for educating young men who may falsely believe that they can use smokeless tobacco without ill consequences to their overall health.

Exercise and Fitness: Association with Cigarette and Smokeless Tobacco Use

Separate bodies of research on tobacco use and physical activity provide strong evidence of the negative impact of tobacco use and the positive effect of physical activity on long-term health (Ravenholt, 1985; USDHHS, 1982, 1983, 1989; Blair, Kohl, Paffenbarger, Clark, Cooper, & Gibbons, 1989; Paffenbarger, Hyde, Wing, & Hsieh, 1986). Much less evidence is available, however, on the association between tobacco use and "spontaneous" exercise activity[1] (Blair, Jacobs, & Powell, 1985; Dishman, Sallis, & Orenstein, 1985) and the independent effects of these factors on physical fitness (Conway & Cronan, In Press). Some previous research has indicated that cigarette smoking is related to endurance components of physical fitness performance (Bahrke, Poland, Baur, & Connors, 1988; Biersner, Gunderson, & Rahe, 1972; Conway & Cronan, 1988; Jensen, 1986), even after controlling for the effects of exercise (Conway & Cronan, In Press). Very little research, however, is available examining the relationships between smokeless tobacco use and either exercise or physical performance (Baldini, Landers, Skinner, & O'Connor, 1992; Lombardo, 1986).

The present study has three primary purposes. First, the associations between exercise activity, physical fitness, and cigarette smoking are examined to see if prior research findings are replicated. Second, the associations between smokeless tobacco and both exercise and physical fitness are examined to compare the findings for cigarette smoking with smokeless tobacco use. Third, the effects of tobacco use, both cigarettes and smokeless, on physical fitness performance are assessed after statistically controlling for the effects of exercise activity so that the independent effects of tobacco use can be determined irrespective of possible differences in exercise levels as a function of tobacco use.

Method

Data examined here were collected from 2,800 U.S. Navy men who participated in a larger study designed to assess physical fitness and life-style information as part of an evaluation of the Navy's Health and Physical Readiness Program. Only men were examined in the present study because the prevalence of smokeless tobacco use among Navy women is so low that

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[1]Spontaneous refers to self-initiated exercise activities as opposed to exercise undertaken as part of a controlled clinical study or program intervention.

sufficient sample sizes for female smokeless users were not available. Participants averaged 29.3 (S.D. = 7.4; range = 17-58) years of age. Primary ethnic groups were Caucasians (76%), Blacks (13%), Filipinos (5%), and Hispanics (4%). Nearly all participants had a high school diploma (92%) or Graduate Equivalency Diploma (6%), and 44% had at least some college education. Subgrouping individuals according to their self-reported use of tobacco (see "tobacco use status" below) resulted in maximum sample sizes of 1,406 nonusers, 161 smokeless tobacco users, and 1,233 cigarette smokers, although these n's were reduced to 975 nonusers, 115 smokeless users, and 825 cigarette smokers in some analyses due to random missing data in the physical fitness measures.

Physical fitness was operationally measured as performance on the Navy's required Physical Readiness Test (PRT), which is a mandated test that all Navy personnel must take biannually (Chief of Naval Operations, 1990). The following components are included in the PRT: 1.5-mile run/walk (cardiorespiratory endurance indicator), 2-minute sit-ups test and 2-minute push-ups test (muscular endurance indicators), and a body composition assessment using a circumference technique (Hodgdon & Beckett, 1984) that estimates the percentage of body weight attributable to fat (percent body fat) and total lean body mass in pounds [computed as weight times (100 minus percent body fat) divided by 100], which is an indicator of overall body strength (Beckett & Hodgdon, 1987).

Participants also completed life-style surveys that included several items on the use of cigarettes, cigars, pipes, and smokeless tobacco. From these items, three tobacco use variables were created: (a) tobacco use status, which subgrouped nonusers of tobacco, users of smokeless tobacco only, and current cigarette smokers who did not use smokeless tobacco; (b) typical number of cigarettes smoked per day during the last 30 days, with nonsmokers coded "zero" cigarettes and those who used smokeless tobacco coded as missing data; and (c) number of times per day smokeless users dipped or chewed, with nonusers coded "zero" times per day and those who smoked cigarettes, cigars, or pipes coded as missing data. Thus, for the analysis of variance (ANOVA) comparisons of exercise and physical fitness components, the tobacco use status variable provided independent groups of "pure" users--either smoke-producing only or smokeless only--versus nonusers of any tobacco products. The tobacco use per day variables provided ordinal measures of cigarette-only use versus no tobacco use and smokeless-only use versus no

tobacco use; these variables were entered into the regression analyses after first entering the exercise kilocalories variable (see below) to determine if tobacco use had independent effects on the physical fitness components after statistically controlling for the effects of exercise activity.

Self-reported exercise activities also taken from survey items included reports on nine common exercise activities: running, continuous walking, swimming, bicycling, racket sports, aerobic dance/exercise, weight lifting, calisthenics, and basketball. Two components for each of these activities were assessed: (a) frequency (i.e., times per week an exercise was done) and (b) duration (i.e., time spent exercising during a workout period). These two components were used to estimate total exercise kilocalories expended per week using activity constants determined by McArdle, Katch, & Katch (1986). For each of the nine common exercises assessed, the frequency and duration variables were multiplied to get total minutes per week engaging in a particular exercise; then this product was multiplied by the constant reflecting the estimated average kilocalories expended per minute while engaging in this exercise. Kilocalories expended in each of the nine exercises were then summed to estimate the overall expenditure of exercise kilocalories per week.

Results

Analysis of variance results indicated that cigarette smokers exercised significantly less on the average than both nonusers of tobacco and smokeless tobacco users, although there was no significant difference in the exercise levels of nonusers and smokeless tobacco users (see Figure 1). Current smokers also had lower levels of physical endurance as indicated by the poorest average performance on the 1.5-mile run (cardiorespiratory endurance) and both the sit-ups and push-ups tests (muscular endurance); however, nonusers and smokeless tobacco users did not show significantly different levels of endurance performance on the run, sit-ups, or push-ups tests (see Figures 2, 3, & 4). Considering the body composition measures, cigarette smokers had significantly lower lean body weight than did nonusers and smokeless users, whereas the latter two groups showed no significant difference in average lean mass (see Figure 5). There were no significant group differences on percent body fat (see Figure 6).

As shown in Table 1, even after controlling for exercise activity, cigarette smoking was significantly (i.e., $p < .0001$ and accounting for at least 1% of the variance) associated with lower physical endurance, both cardiorespiratory (1.5-mile run) and muscular (sit-ups and push-ups).

Smoking was not associated (less than 1% of the variance accounted for) with overall body strength (indicated by total lean body mass) or percent body fat after controlling for exercise activity. In striking contrast with the findings for smokers, smokeless tobacco use was not significantly correlated with exercise levels, nor was use of smokeless tobacco associated with any of the physical fitness measures after controlling for exercise activity.

Discussion

These findings indicate that cigarette smoking is clearly a detriment to physical fitness performance even among relatively young, physically fit men. Replicating prior findings, smokers reported lower levels of exercise activity than did nonusers of tobacco; however, even after statistically controlling for differences in exercise levels, smokers still showed poorer performance on tests of physical endurance (both cardiorespiratory and muscular) than did nonsmokers. On the other hand, there were no significant associations between smokeless tobacco use and either self-reported exercise activity or physical fitness test performance.

The fact that smokeless tobacco users and nonusers of tobacco were similar in exercise and fitness levels has important implications. Young men can apparently use smokeless tobacco without experiencing a decrement in their ability/motivation to exercise or in their physical endurance capacity. Thus, these men may falsely believe that they can use smokeless tobacco without ill consequences to their overall or long-term health. This clearly is untrue, as smokeless tobacco use plays a causative role in the development of certain types of cancer, noncancerous and precancerous oral diseases, and a variety of adverse health effects associated with nicotine addiction (USDHHS, 1986).

Although overall smoking rates have declined over the last two decades, smokeless tobacco use has actually increased, especially among young men (USDHHS, 1986). This underscores the importance of educational efforts regarding the long-term ill effects of smokeless tobacco use. Educational efforts should especially be targeted toward young men who may comprise the group most inclined to use smokeless tobacco or switch from cigarettes to smokeless tobacco under false assumptions that smokeless tobacco will do them no harm.

References

Bahrke, M. S., Poland, D. F., Baur, T. S., & Connors, D. F. (1988). Tobacco use and performance on the U. S. Army physical fitness test. Military Medicine, 153, 229-235.

Baldini, F. D., Landers, D. M., Skinner, J. S., & O'Connor, J. S. (1992). Effects of varying doses of smokeless tobacco at rest and during brief, high-intensity exercise. Military Medicine, 157, 51-55.

Beckett, M. B., & Hodgdon, J. A. (1987). Lifting and carrying capacities relative to physical fitness measures (Report No. 87-26). San Diego, CA: Naval Health Research Center.

Biersner, R. J., Gunderson, E. K. E., & Rahe, R. H. (1972). Relationship of sports interests and smoking to physical fitness. Journal of Sports Medicine, 12, 124-127.

Blair S. N., Jacobs, D. R., Jr., & Powell, K. E. (1985). Relationships between exercise or physical activity and other health behaviors. Public Health Reports, 100, 172-180.

Blair, S. N., Kohl, H. W., Paffenbarger, R. S., Jr., Clark, D. G., Cooper, K. H., & Gibbons, L. W. (1989). Physical fitness and all-cause mortality. A prospective study of healthy men and women. Journal of the American Medical Association, 262, 2395-2401.

Chief of Naval Operations. (1990). OPNAVINST 6110.1D: "Physical Readiness Program." Issued on 18 January 1990.

Conway, T. L., & Cronan, T. A. (1988). Smoking and physical fitness. Military Medicine, 153, 589-594.

Conway, T. L. & Cronan, T. A. (In Press--1992). Smoking, exercise, and physical fitness. Preventive Medicine, In Press. (Based on NHRC Report No. 90-43.)

Dishman, R. K., Sallis, J. F., & Orenstein, D. R. (1985). The determinants of physical activity and exercise. Public Health Reports, 100, 158-171.

Hodgdon, J. A. & Beckett, M. B. (1984). Prediction of percent body fat for U.S. Navy men from body circumferences and height (Report No. 84-11). San Diego, CA: Naval Health Research Center.

Jensen, R. G. (1986). The effect of cigarette smoking on Army physical readiness test performance of enlisted Army medical department personnel. Military Medicine, 151, 83-85.

Lombardo, J. (1986). Stimulants and athletic performance (part 2): Cocaine and nicotine. The Physician and Sports Medicine, 14, 85-90.

McArdle, W. D., Katch, F. I., & Katch, V. L. (1986). Exercise physiology: Energy, nutrition, and human performance (2nd ed.). Philadelphia, PA: Lea & Febiger, 642-649.

Paffenbarger, R. S., Hyde, R. T., Wing, A. L., & Hsieh, C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. New England Journal of Medicine, 314, 605-613.

Ravenholt, R. T. (1985). Tobacco's impact on twentieth-century U. S. mortality patterns. American Journal of Preventive Medicine, 1, 4-17.

U.S. Department of Health and Human Services. The Health Consequences of Smoking: Cancer. A Report of the Surgeon General. U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health. DHHS Publication No. (PHS) 82-50179, 1982.

U.S. Department of Health and Human Services. The Health Consequences of Smoking: Cardiovascular Disease. A Report of the Surgeon General. U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health. DHHS Publication No. (PHS) 84-50204, 1983.

U.S. Department of Health and Human Services. The Health Consequences of Using Smokeless Tobacco. A Report of the Advisory Committee to the Surgeon General, 1986. U.S. Department of Health and Human Services, Public Health Service. NIH Publication No. 86-2874, April 1986.

U.S. Department of Health and Human Services. Reducing the Health Consequences of Smoking: 25 years of Progress. A Report of the Surgeon General. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. DHHS Publication No. (CDC) 89-8411, 1989.

Figure 1

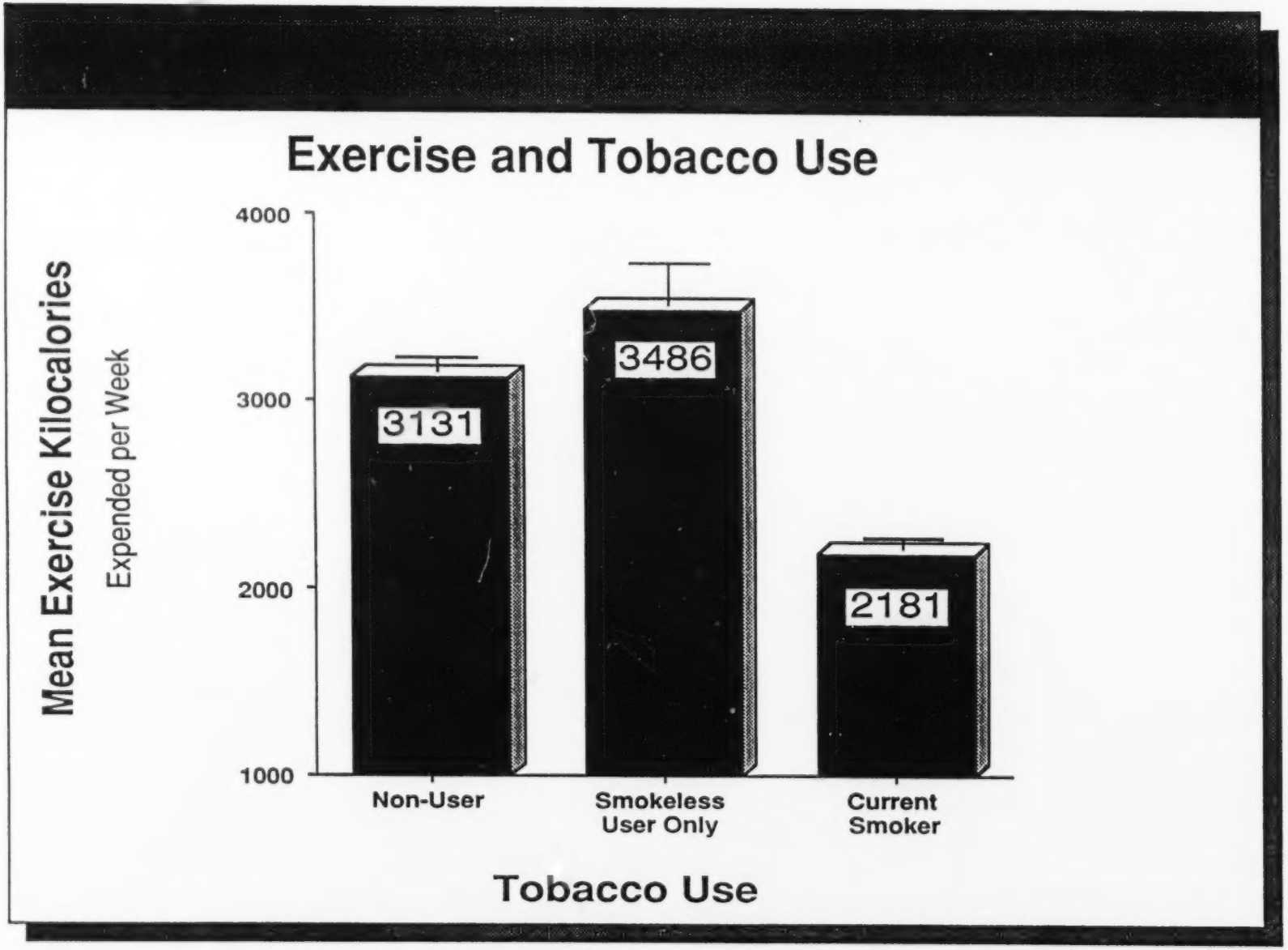
Exercise and Tobacco Use
Mean Exercise Kilocalories
Expended per Week
4000
3000
2000
1000
3131
3486
2181
Non-User
Smokeless User Only
Current Smoker
Tobacco Use

Figure 2

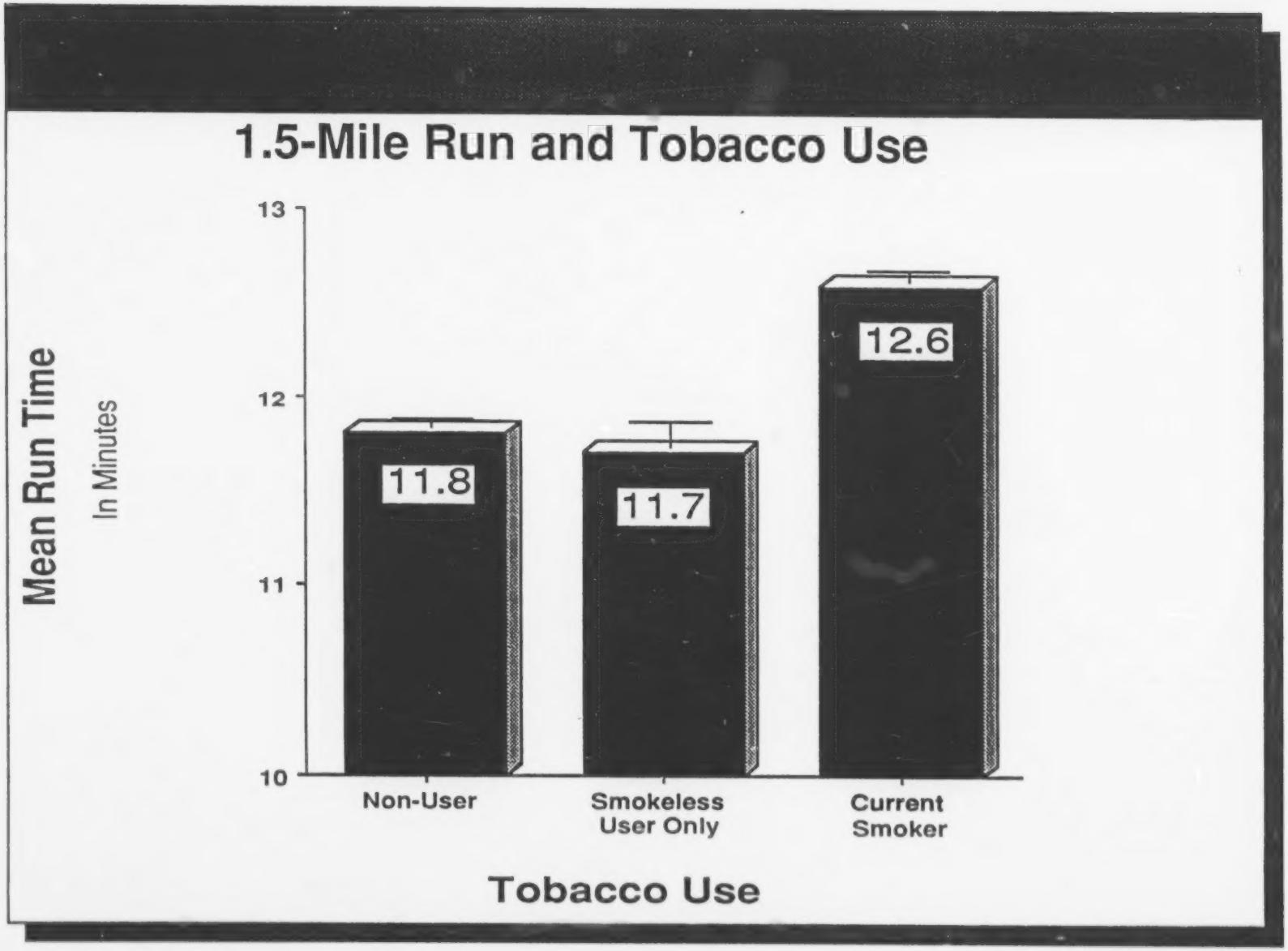
1.5-Mile Run and Tobacco Use
Mean Run Time
In Minutes
13
12
11
10
11.8
11.7
12.6
Non-User
Smokeless User Only
Current Smoker
Tobacco Use

Figure 3

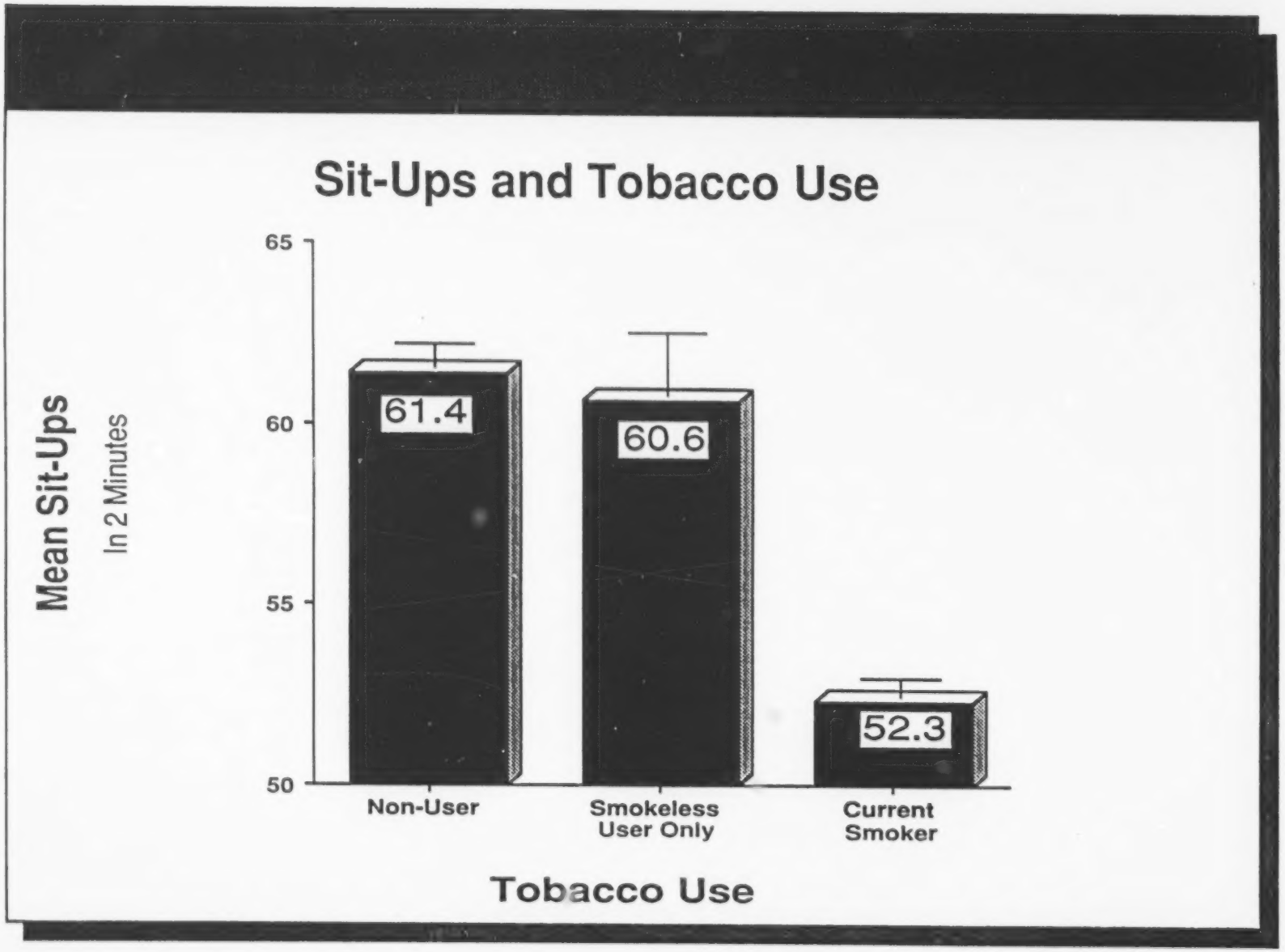
Sit-Ups and Tobacco Use
Mean Sit-Ups
In 2 Minutes
65
60
55
50
61.4
60.6
52.3
Non-User
Smokeless User Only
Current Smoker
Tobacco Use

Figure 4

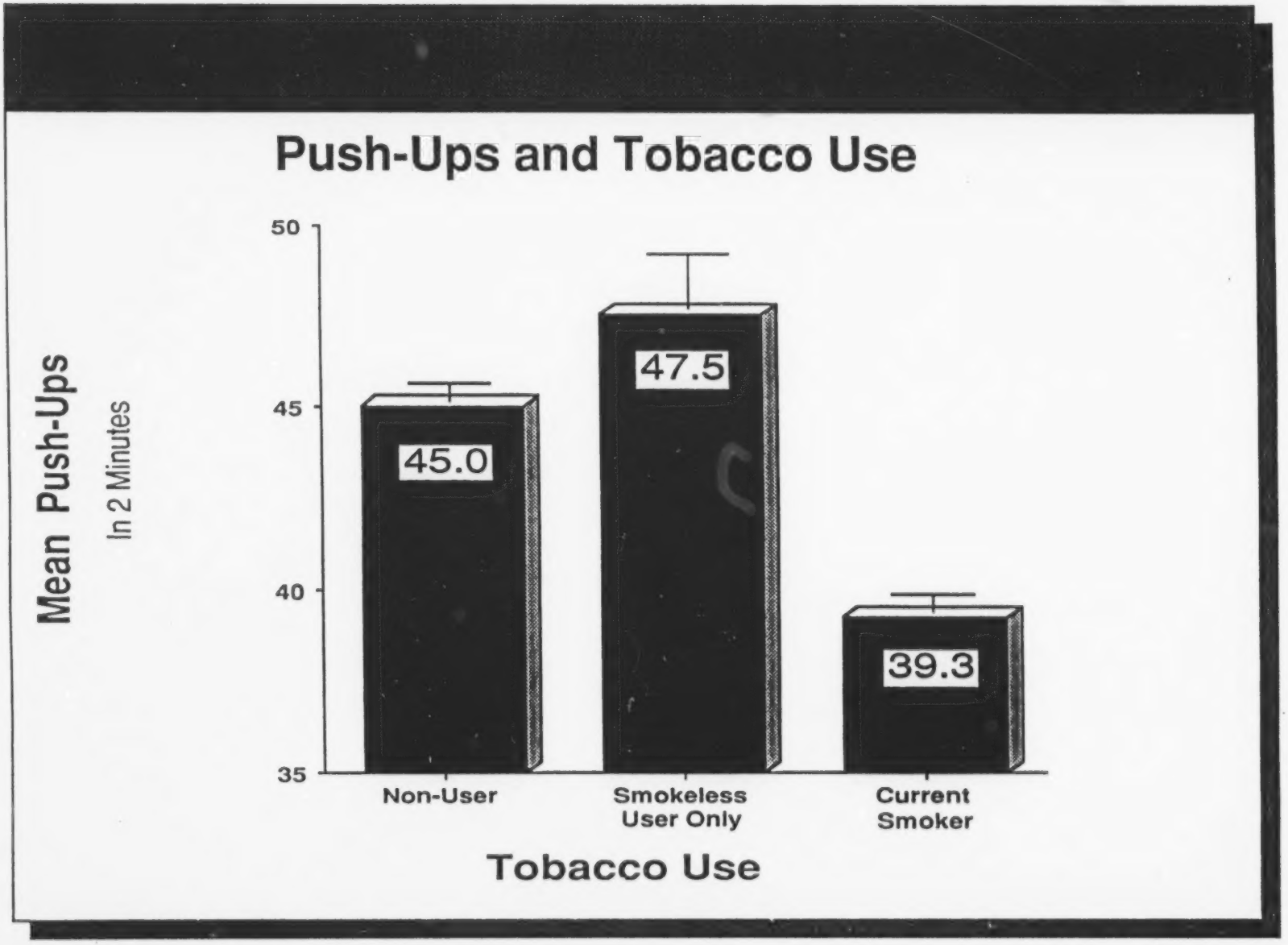
Push-Ups and Tobacco Use
Mean Push-Ups
In 2 Minutes
50
45
40
35
45.0
47.5
39.3
Non-User
Smokeless User Only
Current Smoker
Tobacco Use

Figure 5

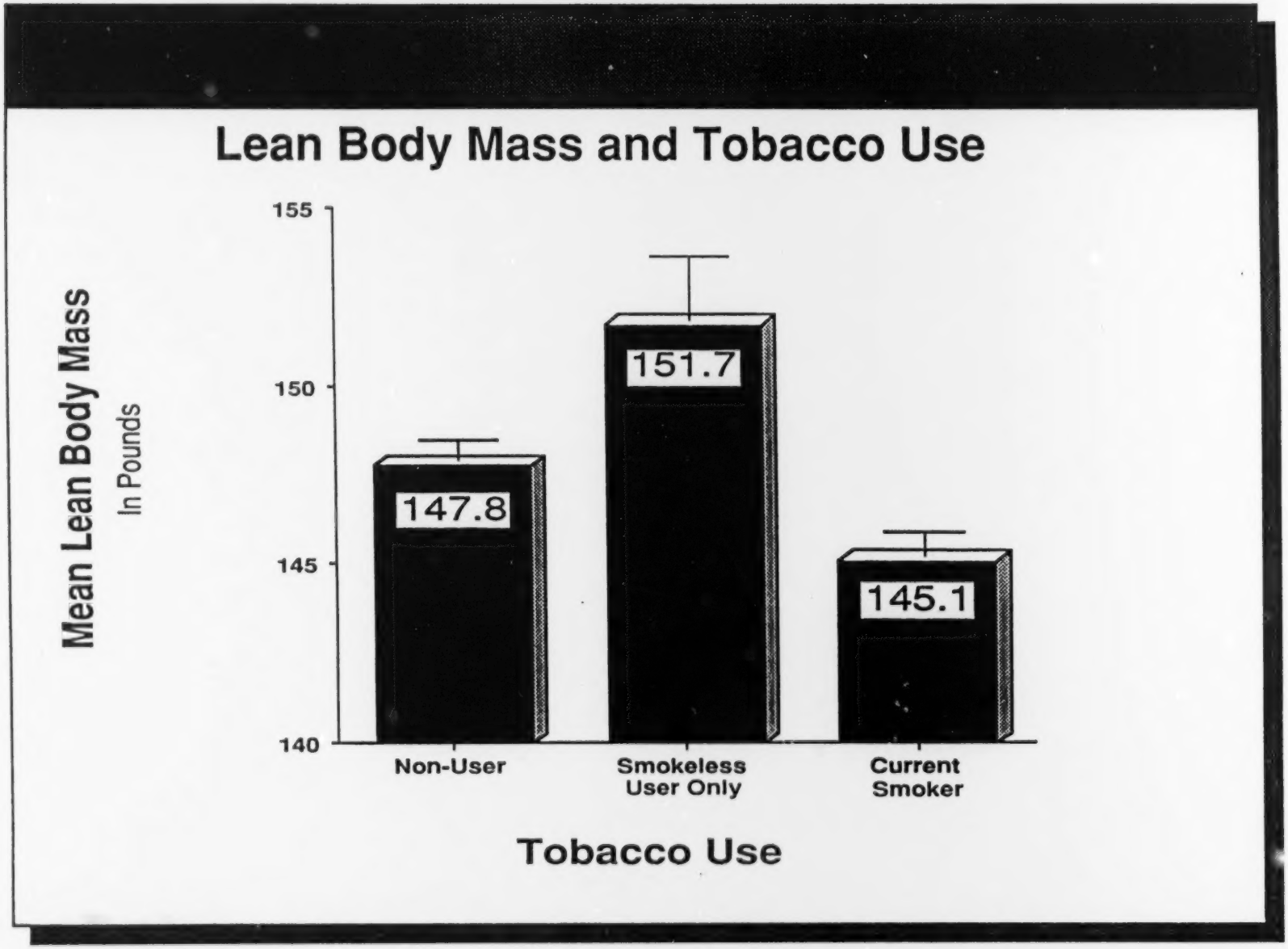
Lean Body Mass and Tobacco Use
Mean Lean Body Mass
In Pounds
155
150
145
140
147.8
151.7
145.1
Non-User
Smokeless User Only
Current Smoker
Tobacco Use

Figure 6

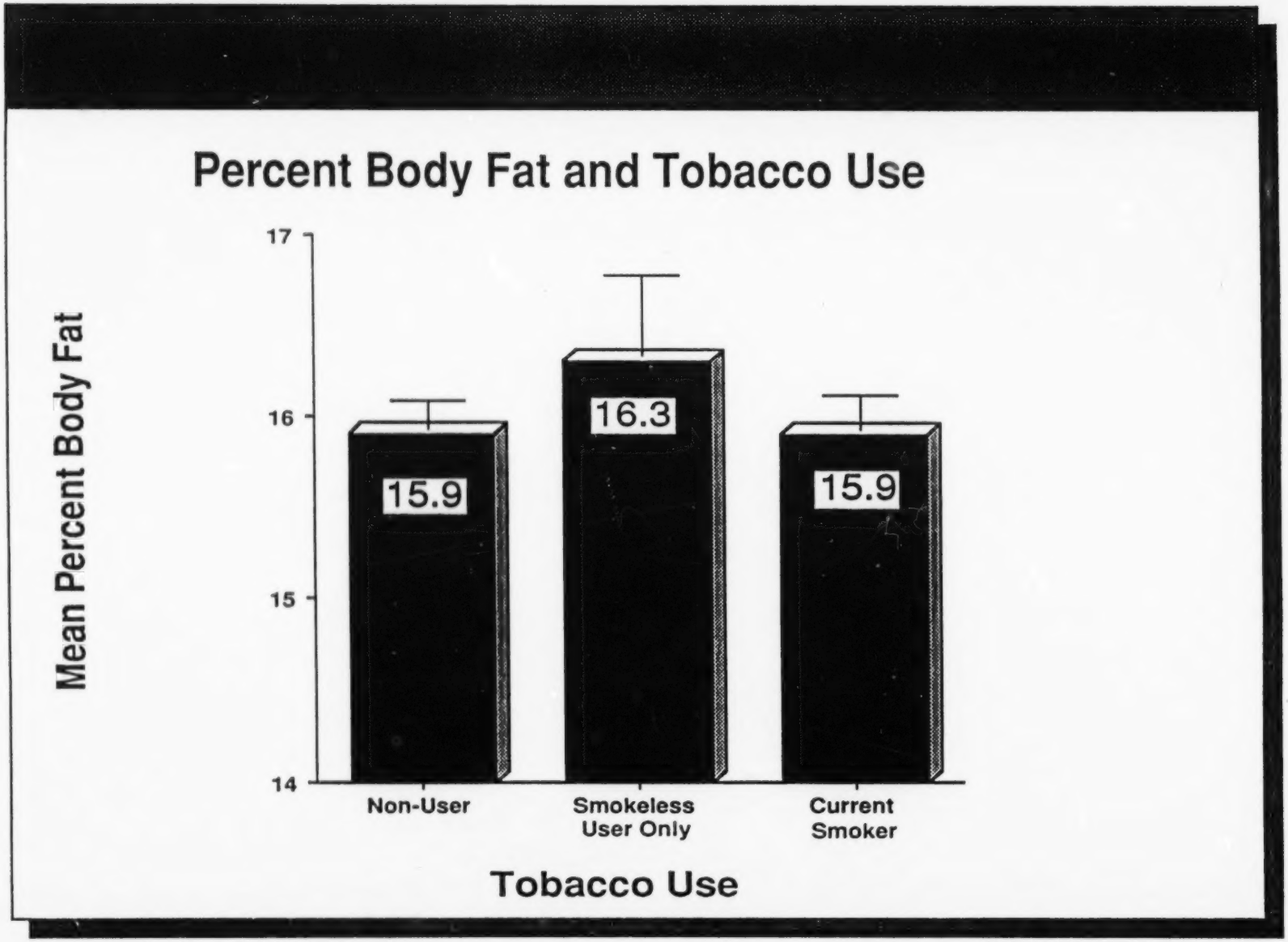
Percent Body Fat and Tobacco Use
Mean Percent Body Fat
17
16
15
14
15.9
16.3
15.9
Non-User
Smokeless User Only
Current Smoker
Tobacco Use

Table 1

Criterion	Predictors[1]	Cigarette Smokers and Nonusers R	Cigarette Smokers and Nonusers R-sq.change	Smokeless Users and Nonusers R	Smokeless Users and Nonusers R-sq.change
1.5 MILE RUN	Exercise Kcals/wk	.29	.082*	.30	.090*
	Tobacco Use/day	.35	.040*	.30	.001
SIT-UPS	Exercise Kcals/wk	.34	.118*	.34	.118*
	Tobacco Use/day	.38	.028*	.34	.000
PUSH-UPS	Exercise Kcals/wk	.30	.092*	.27	.073*
	Tobacco Use/day	.34	.021*	.27	.001
% BODY FAT	Exercise Kcals/wk	.11	.012*	.14	.020*
	Tobacco Use/day	.11	.000	.14	.000
LEAN BODY MASS	Exercise Kcals/wk	.11	.011*	.07	.005
	Tobacco Use/day	.13	.004	.08	.001

[1] Exercise kilocalories forced to enter equation first.

* $p < .0001$ and accounted for at least 1% of variance.